ENVIRONMENTAL PROTECTION

ZANNI GROUP™

It's time for change!

"Everything should be made
as simple as possible,
but not simpler."

Albert Einstein

OUR MISSION

Development of Technologies and Work Flows
for the Protection of the Environment.

Environmental protection

ZANNI GROUP™

ENVIRONMENTAL PROTECTION HAS A STATUS OF GROWING IMPORTANCE

As a result of population growth and the development of technology that consumes more and more resources, the environment has been massively damaged.



THE PROTECTION OF THE ENVIRONMENT IS NECESSARY FROM VARIOUS ANGLES

- Climate change is progressing in an almost inevitable and destructive way.
- Permafrost soils thaw and release gases, bacteria and toxins that threaten our lives.
- Rising sea levels threaten entire regions with total destruction.
- Soil, water and air are contaminated by waste and climate-wrecking methane is released in large quantities through decay.
- Environmental pollution through toxic substances is progressing.
- Droughts and water shortages lead to population migrations as the basis for their life is deprived.
- The loss of biological diversity is continuing.
- The introduction of invasive species endangers also the biodiversity of our habitats.
- Genetically modified organisms, bacteria and viruses are emerging.

The environmental challenges in our world are many and interlinked. The challenges we work to improve the environmental situation with our projects. Dealing with nature and energy need to preserves resources and that will pay off in the long run.

CONSULTING AND DEVELOPMENT OF A HUGE RANGE OF ENVIRONMENTAL IMPACT PRODUCT'S IS A PART OF OUR BUSINESS. Environmental protection as a primary goal describes very well how we develop our products.

Environmentally conscious planning, specification and project implementation means permanent monitoring and compliance with all regulations and ordinances. When new products and processes are introduced, their environmental impact and energy efficiency are assessed in order to avoid environmental, energy and safety risks.

Failure Mode and Effects Analysis (FMEA), for example, is an excellent tool for avoiding risks and protecting people and nature. These means are also part of our tools.



We promote environmental and energy awareness through our information to customers, suppliers and other interest groups. Our products and services demonstrate this philosophy.

On the following page we will guide you through our services.

Environmental protection

ABOUT US AND OUR SERVICES

Under the umbrella of the ZANNI GROUP various companies have been acting together worldwide since 1994.
Disciplines have united to provide the best possible service to our customers.

We offer excellent products that meet the high quality standards of ISO 9001:2015.
Our customer portfolio ranges from international companies to government organizations.

We have acquired a broad technical KNOW-HOW over the decades.

Today, this is incorporated into the development of advanced combustion systems with patented technology, other environmentally friendly solutions for industry, as well as infrastructure protection.

Examples include preventive fire protection and preventive flood protection.

Our business areas, consulting, environmental protection and plant engineering for combustion technology as well as gas and water technology, complement each other and enable us to offer holistic consulting and technical solutions for many tasks and environmental problems.



SERVICES

Our services in the field of environmental consulting and pollutant analysis (examples)

- Pollutant survey of buildings and outdoor facilities for various components such as asbestos, fungus, sponge, PCB, PCP, PAH, dioxins, fire and land damage, as well as contaminated sites.
- Preparation of fire protection concepts, as well as visualization of preventive fire protection, representation of escape route and fire department plans, as well as run maps.
- Preparation of safety concepts for major events.
- Preparation of technical expert opinions.
- Safety and health protection coordinator (SiGeKo), preparation of SiGe plans and safety engineering services.
- Remediation planning and preparation of expert opinions, specifications, tenders, preservation of evidence and expert activities.
- Calculation and execution (site management) of contaminant remediation.
- Preparation of soil surveys for water-polluting substances.
- Expert according to AwSV (until 2017: "VawS"), expert according to DIN 1999/100.
- Expert for fire damage, mold detection, evaluation and remediation.
- Advice on infrastructure protection and safeguarding.

On the following pages we will guide you through our products.

Environmental protection

PREVENTIVE FIRE PROTECTION

For buildings of a special type and use, for example industrial plants, sports stadiums and multi-purpose halls, hospitals and public facilities, or in the event of a deviation from the requirements of building law, the preparation of a fire protection concept is mandatory.

In doing so, the fire protection concept is always adapted to the individual case, the protection goals of which are derived from the public legal requirements (in accordance with the building regulations, the guidelines, the building inspectorate and the fire brigade) as well as the ideas of the building owners, operators and insurers.

The fire protection concept should include individual measures from the preventive structural and plant fire protection, the organisational, i.e. the operational fire protection and the defensive fire protection and is thereby a component of integral project planning for the building planning, regardless of whether it is a new building or a renovation.

Focus of the protection goals

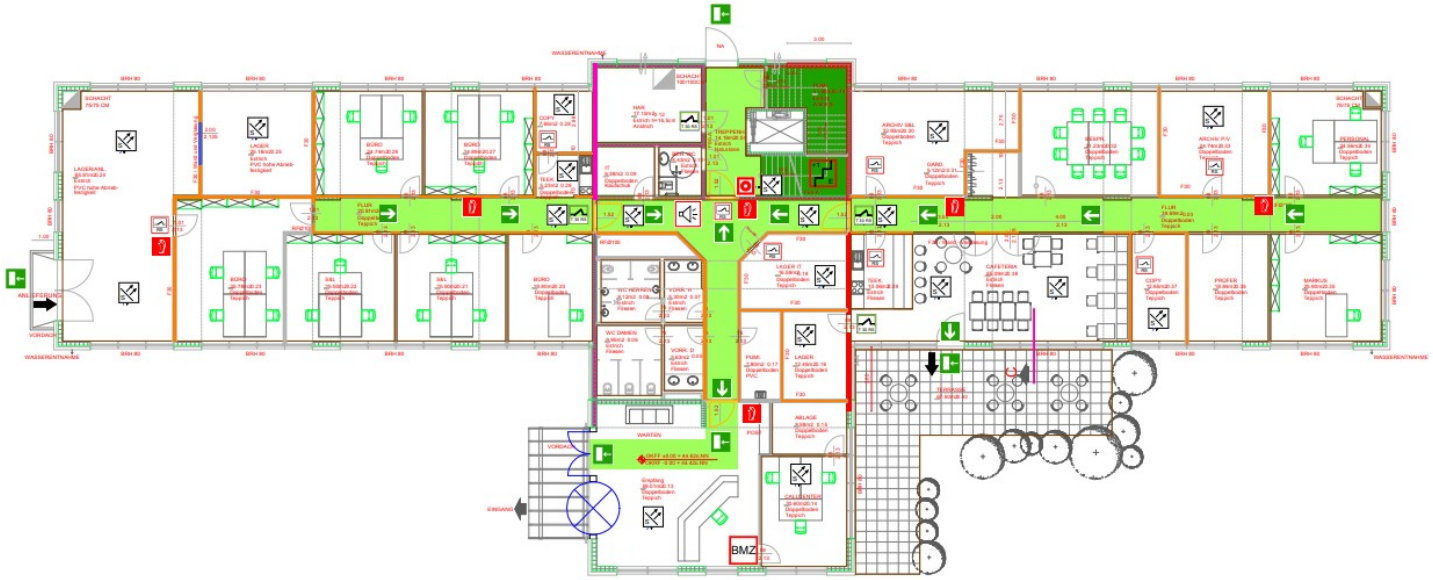
- Protection for users and visitors of a building,
- protection for rescue and fire-fighting forces in the event of fire,
- the protection of cultural assets,
- protection from ecological damage (environmental protection),
- protection against damage to the neighbourhood and
- the protection of material assets and business interruption for the building fabric and its contents.

Our fire protection concepts are decision-making aids for you in the event of an emergency.

Together we determine which measures are to be taken and with what priority.

Should structural deficiencies become apparent during planning, we also take into account appropriate compensatory measures, such as the installation of a fire alarm system with corresponding conceptual design according to DIN 14675 Phase 5 and similar necessities.

A balanced cost-benefit ratio is always an essential part of our planning and helps you to implement your building projects.



Environmental protection

PREVENTIVE FLOOD PROTECTION SYSTEM

Climate change is increasingly leading to floods and flood events with enormous damages to property.

It is also a huge risk for the people.

Preventive hazard protection plays an important role in all areas.

Let's think of fire protection, for example. Here, standards have prevailed that have prevented many disasters.

There are also possibilities for preventive flood protection, but these have not yet been applied in the less affected countries and areas.

This may be due to a lack of willingness to invest or simply a lack of understanding.

we are not talking about systems that act directly on buildings, such as sheet pile walls or other systems as water penetration protection, but about large-scale construction measures that have a general area effect.

Of course, we cannot build systems that can completely prevent floods, but we can buy time for evacuation measures and lower water levels and, at best, provide complete flood protection in certain areas. But that always depends on how such a system can be installed and what the local geological drainage conditions are.

There are already underground shafts and catchment basins, such as in London or Tokyo, which specifically collect precipitation and surface water or, near the sea, storm water. This can mitigate and, at best, prevent damage.

The construction of such large catchment basins is mainly possible in undeveloped areas.

In sealed and built-up areas, retrofitted systems for hazard prevention make sense, but are often not possible in conventional construction.

We have already developed a system for this years ago, whose time has now certainly come.

It does not protect only individual buildings, but large areas, depending on how strongly we prioritizes area protection and how important the preservation of infrastructure is rated.

With our patented system, we can subsequently install large collection systems in areas and spaces inside and outside built-up areas, with which precipitation and surface water, or storm water near the sea, can be collected in a targeted manner.

Construction projects can be implemented quickly and easily also in small spaces to relieve infrastructure and traffic flows during construction work.

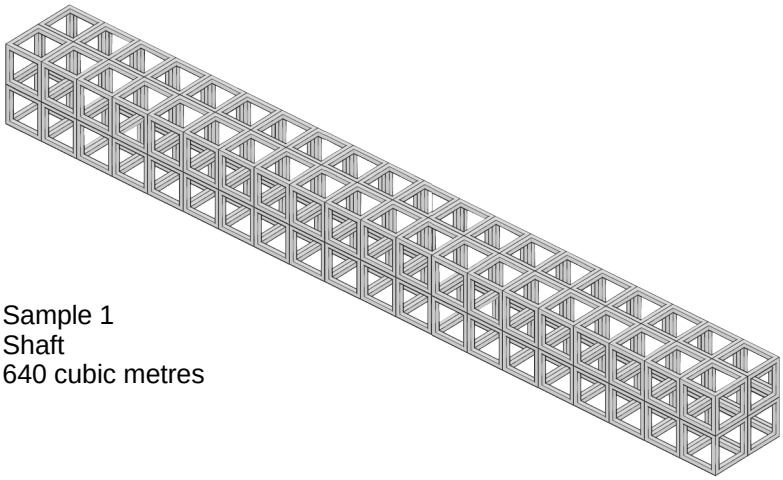
Construction work can be carried out with lighter construction machinery in order to protect natural areas and avoid unnecessary soil compaction.

Flood spaces are created by prefabricated concrete skeleton blocks. The concrete skeleton blocks are designed in square or rectangular form.

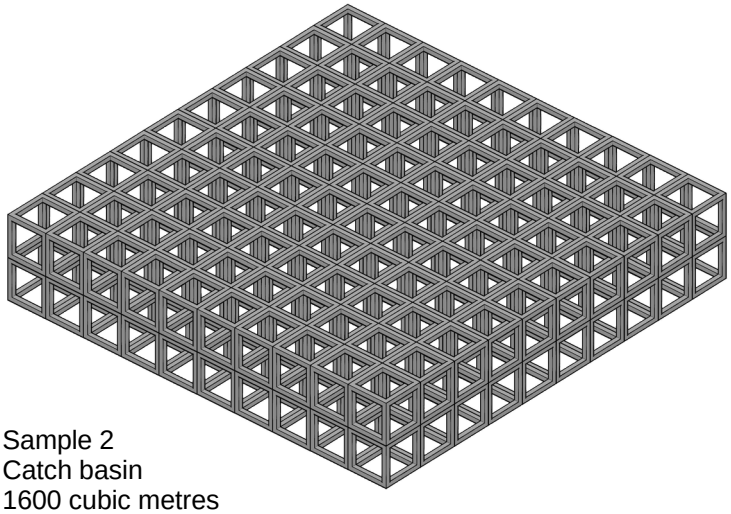
They are also reinforced according to requirements and calculated loads.

They can be stacked several times and thus form required shafts and catch basins.

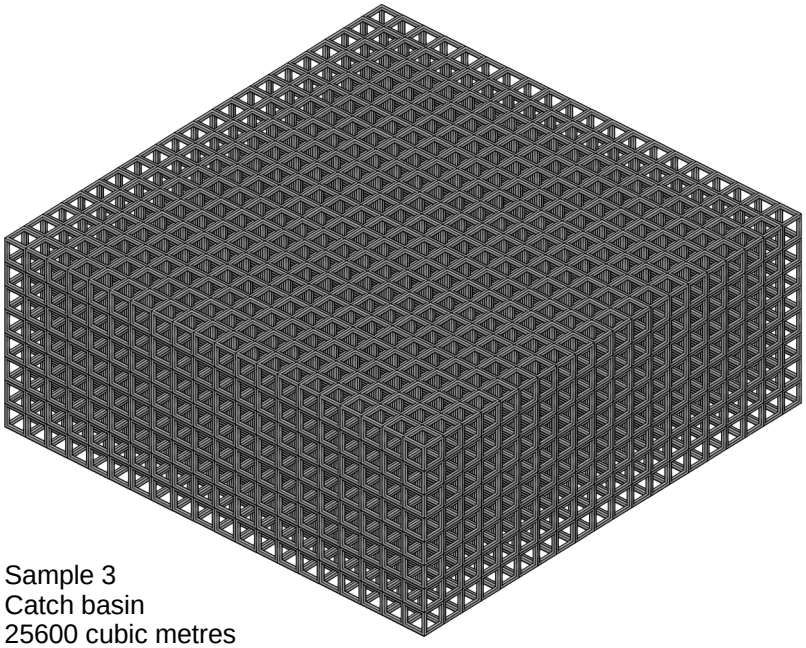
Environmental protection



Sample 1
Shaft
640 cubic metres



Sample 2
Catch basin
1600 cubic metres



Sample 3
Catch basin
25600 cubic metres

Depending on the defined size, they can be driven over underground.

The water inlet can be adapted constructively in a wide variety of ways as required.

Pumps, controllers, sensors with IDoT chips, for operating a plant and documenting events can be installed within the system.

Plant data can be sent and documented via a blockchain or the IOTA Tangle to participants such as authorities.

Advantages of the civil engineering system

- Easy and fast to install.
- Installation in the smallest space.
- Installation with small construction machines.
- No soil compaction by large construction machinery.
- Easy delivery of the prefabricated system by standard trucks.
- Very cost effective.
- Small or huge shafts and basins possible.
- Eliminates risks!

Potential target groups

Certainly interesting for politics, investment companies, insurance companies, and so on.

We don't need to export concrete!

We can also offer our system as a project service. That means we support you in your planning, provide you with the system as a license service and advise you on the implementation.

We want you to live safely and plan responsibly.

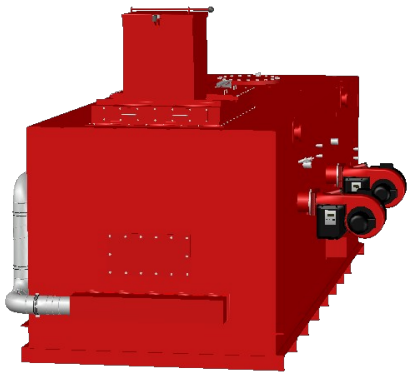
- **Reduce risks**
- **Reduce costs**
- **Safe lives**

ENGINEERING
MADE IN GERMANY

Environmental protection

COMBUSTION FURNACES

Suitable for all types of waste, such as clinical waste, contaminated materials, other solid and sludgy wastes, like sewage sludge.



The heart of every plant is of course the combustion chamber, with its grate and combustion system philosophy.

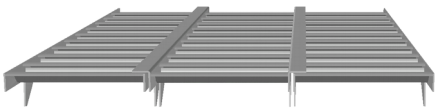
For this, all parameters of the combustible material are taken into account, as well as the question of sustainability in dealing with the waste.

Our combustion furnace has a two-chamber ceiling loading system consisting of a manual or optionally automatic chamber opening, together with a driven slide system to separate the combustion chamber.

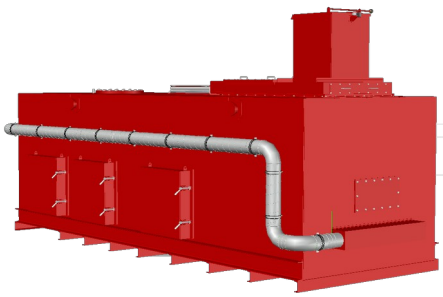
Two or more burner systems are used to heat up the system and to support the firing at low calorific values of the waste. A burner system for the main combustion chamber and a burner system for the afterburner chamber.

Depending on its size the main and afterburner chambers can be divided from each other. The combustion chamber temperature is between 850 - 950 °C in the main combustion chamber and 950 - 1150 °C in the afterburner chambers. The firing temperatures are automatically controlled according to local specifications. An emergency system (pressure and temperature dependent) is available.

The ventilation of the main chamber is on the front side and is adapted to the patented combustion grate system.



In the past, we have used old-fashioned technology that reliably fulfilled its tasks, but reached its limits in the area of wear and tear and also in maintenance. We took a closer look at these problems and created a new type of combustion grate that is easy to maintain and favourable in its manufacture and replacement, as combustion gratings are wearing parts. The afterburner chambers are ventilated on the side. Ventilation is provided by one or more combustion air fans, the control of which is regulated by corresponding oxygen measurements to ensure sufficient oxygen enrichment and thus complete combustion.



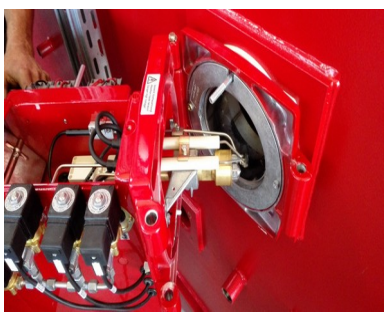
The system contains 2 sight glasses into the combustion chamber as well as numerous connections and connection possibilities for necessary and additional measuring instruments.

The ash is removed manually via 3 large ash removal doors or optionally via an automatic wet ash removal system.

There is no uniform solution, but only adaptable technical solutions in general. Each plant is therefore designed to meet the specific requirements and of course the highest environmental standards. We have a wide range of solutions available for this purpose.

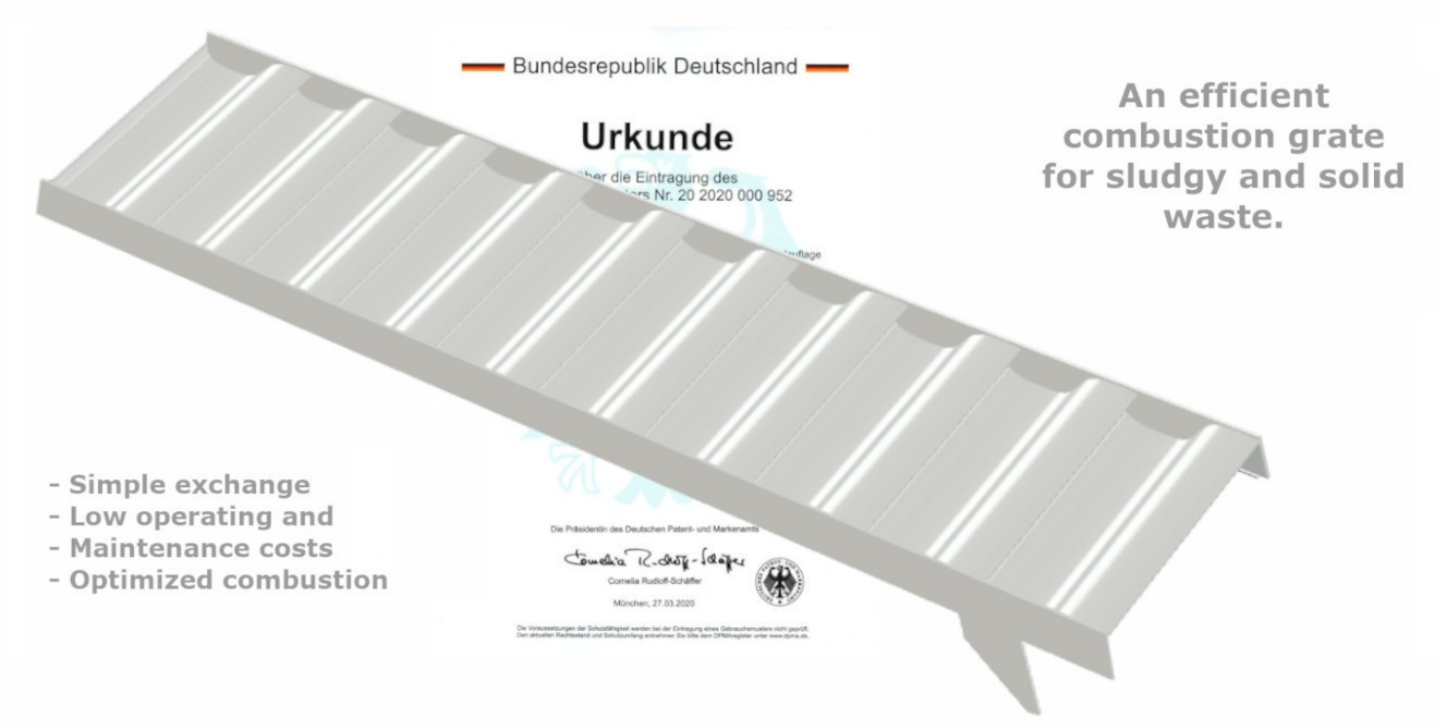
Key figures

- **Environmental friendly** (reduces the environmental impact of the greenhouse gas methane by rotting of waste)
- Available capacities for sludge: 200, 300, 400, 500, 600, 800 and 1000 kg/h @ 15000 kJ/kg
  Available capacities for solids: 400, 600, 800, 1000, 1200, 1600 and 2000 kg/h @ 15000 kJ/kg
  Larger systems as individual solutions.
- Patented grate system, suitable for all types of waste, such as clinical waste, contaminated materials, other solid and sludgy wastes, like sewage sludge.
- Automatic control systems.
- Manual feeding via top loading device (closed chamber system) and manual ash removal. Automatic feeding and ash removal as option (pls. see next page).
- Large side chamber doors, also usable for revision access.
- Inspection opening at the front for easy replacement of the combustion grate.

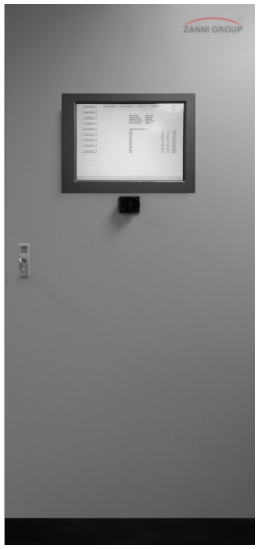


Environmental protection

AN ENVIRONMENTALLY FRIENDLY INCINERATION GRATE FOR ALL TYPES OF WASTE



CONTINUOUS EMISSION MONITORING SYSTEMS (CEMS)



CEMS are used as a tool to monitor flue gas for oxygen, carbon monoxide and carbon dioxide to provide information for combustion control in industrial settings.

They are currently used as a means to comply with air emission standards.

Facilities employ the use of CEMS to continuously collect, record and report the required emissions data.

Envisaged analyses could be for example

- HCl (hydrogen chloride),
- Cl2 (chlorine),
- NOx (nitrogen oxides),
- SOx (sulfur oxide),
- CO (carbon monoxide),
- TOC (total organic carbon).

The standard CEM system consists ordinary of

- a sample probe,
- a filter,
- a sample line,
- a gas conditioning system,
- of course a calibration gas system,
- and at least a series of gas analyzers for monitoring of the required parameters.

In monitoring the emissions, the system must be in continuous operation and must be able to sample, analyze and record data at least every 15 minutes and then averaged hourly. That means the operation frequency can be either continuous operation or activation at a predefined frequency or upon demand.

DATA SECURED TRANSMISSION SYSTEM (dsts)

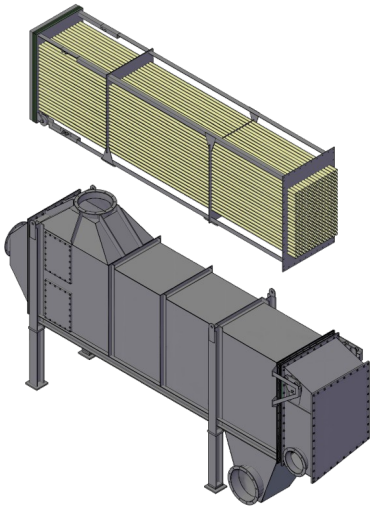
Our preferred system "Data Secured Transmission System (dsts)" avoids manipulated data after the fact. So far, we have used secured PC systems for this purpose and offered data access via modems or other connections if desired.

To achieve the same goal, we now also offer to develop a suitable solution for your plant via the IOTA network. The hardware requirements are reduced by the process. IOTA provides a digitally secured infrastructure through which communication and payment can be made, e.g. for electricity, data, certificates, documentation. The transactions are free of charge.

As each facility is adapted to local conditions and configured differently, this dsts must be developed or adapted for your facility.

Environmental protection

ENVIRONMENTAL FRIENDLY PATENTED AIR / AIR COOLER



In the past, we have also for the flue gas coolers and heat exchangers used old-fashioned technology that reliably fulfilled its tasks, but reached its limits in the area of wear and tear and also in maintenance. In the same order as we did with the combustion grate system we took a closer look at these problems and created a new type of flue gas cooler that is very easy to maintain.

But easy to maintain is not the only target what we had focused on.

The new design is long resistant against heat, abration and acids which is naturally dependent on selected materials.

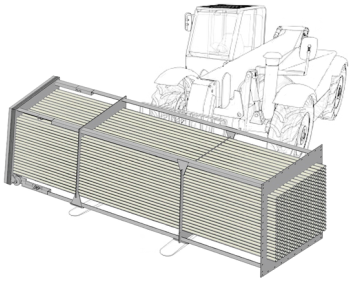
Since the cooling circuit is shielded from the flue gas and the heat and thus energy transfer to the cooling air is due to the engineering enormous, it is nearly inevitable that this cooling air can be used further and thus the efficiency of a plant can be increased.

Of course also the efficiency of an older, existing plant can be increased.

The design of the new cooler and the way it is implemented is both logical and consequent. The cooler design is an air/air cooler. In the design, the flue gas and cooling air side are considered as independent systems.

One system, the flue gas side, must be resistant to heat, abrasion and corrosion and the other, the clean cooling air side, to sometimes enormous temperatures, depending on the design of the plant. We have also constructively implemented the thermal, mechanical problems that arise on the cooling air side.

Of course, the flue gas pipes are still exposed to a great deal of stress and their durability can be increased by using special steels, but they are still nothing more than wearing parts from a classical point of view.



If you take this problem into account, then you inevitably have to create a simple maintenance option, which we have implemented in our cooler.

The entire rear chamber part can be easily removed and the tube bundles can be replaced just as easily on their sliding frame. This significantly reduces downtime and keeps maintenance costs to a minimum.

The temperature ranges for the flue gas side are, depending on the design of the upstream plant, between 850 - 1200 °C and the cooling air side between 300 - 650 °C.

Deviations are of course possible depending on the individual design of each plant.

Advantages of the new and patented cooler design

- **Environmental friendly** (no water required for the cooling process)
- Easy to maintain.
- Long resistant against heat.
- Long resistant against acids.
- Long resistant against abration.
- Heat recovery via clean cooling air possible.
- No material attack of the secondary air cooling circuit by aggressive media.
- Long service life.

Each system requires an individual configuration.

Of course larger boiler systems are also available!

Environmental protection

FILTER SYSTEMS AND FLUE GAS CLEANING

There are two ways to filter the exhaust gas.

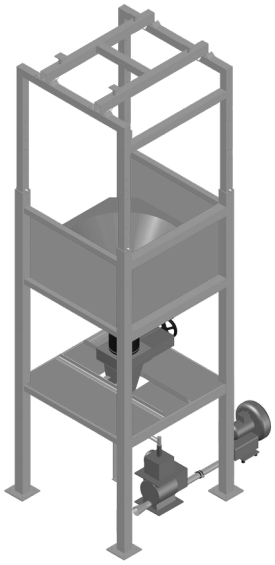
On the one hand there is the wet and dry washing technology and on the other hand the electrostatic filter technology. For our systems we mainly use the dry washing technology.

For our dry washing technology we can offer ceramic filters and fabric filters. We prefer ceramic filters for our furnaces up to 400 kg/h, as these have a very high filter efficiency on the one hand and a very long service life on the other.

Which of these both filter technologies is suitable is mainly a question of the amount of exhaust gas and the media itself.

DRY-WASHING SYSTEMS

For our dry-washing systems we additionally recommend to use a dry-scrubbing-solvent injection system.



A dry-scrubbing-solvent injection by means of a dosing station is used to remove particles and gases from the exhaust gas streams via dusted air filters.

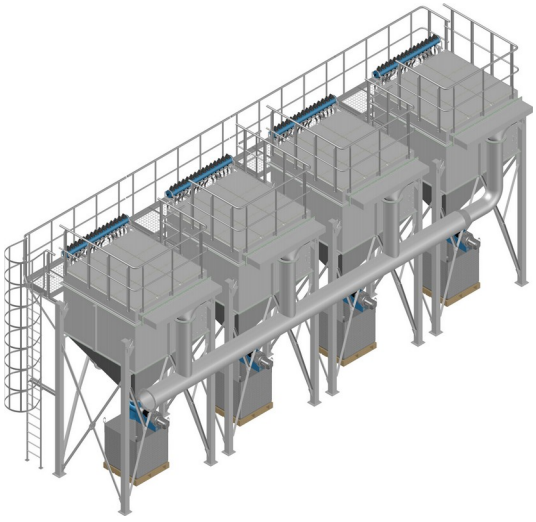
These dry scrubbing systems are used to remove corrosive and toxic gases (for example SO2 and HCl) from the exhaust gas. They are very effective with low investment and operating costs.

Many acid gases, such as ammonia and hydrogen chloride are water soluble and react aggressively when moisture is added to the gas. Dry gas scrubbers add either no or very little liquid to the exhaust gas they are cleaning. This means that they are less prone to corrosion. This means that they do not require waste water disposal procedures or steam plumes - common scrubber accessories.

The dry gas scrubber simply injects a sorbent that efficiently captures and absorbs acid gases. Odorous, corrosive gas by-products can be additionally removed from the exhaust gas by adding activated compounds that treat certain pollutants.

Once it has absorbed all harmful compounds, it is removed from the filter elements together with excess sorbent by a control device.

Dry scrubbing systems are an important part of gas phase filtration and are therefore best suited for maintaining high environmental standards.



The functionality of the filter system is based on its filter in interaction with the dry scrubbing solvent system.

At a certain differential pressure level the filter will be cleaned by pressure air with a reverse jet cleaning system which clean the filter by a jet impulse and the dust layer on the outside surface of the filter will fall down.

At the bottom of the filter the ash feed by a rotary valve to a big bag or ash container.

Environmental protection

CORROSION PROTECTION OF FILTER SYSTEMS

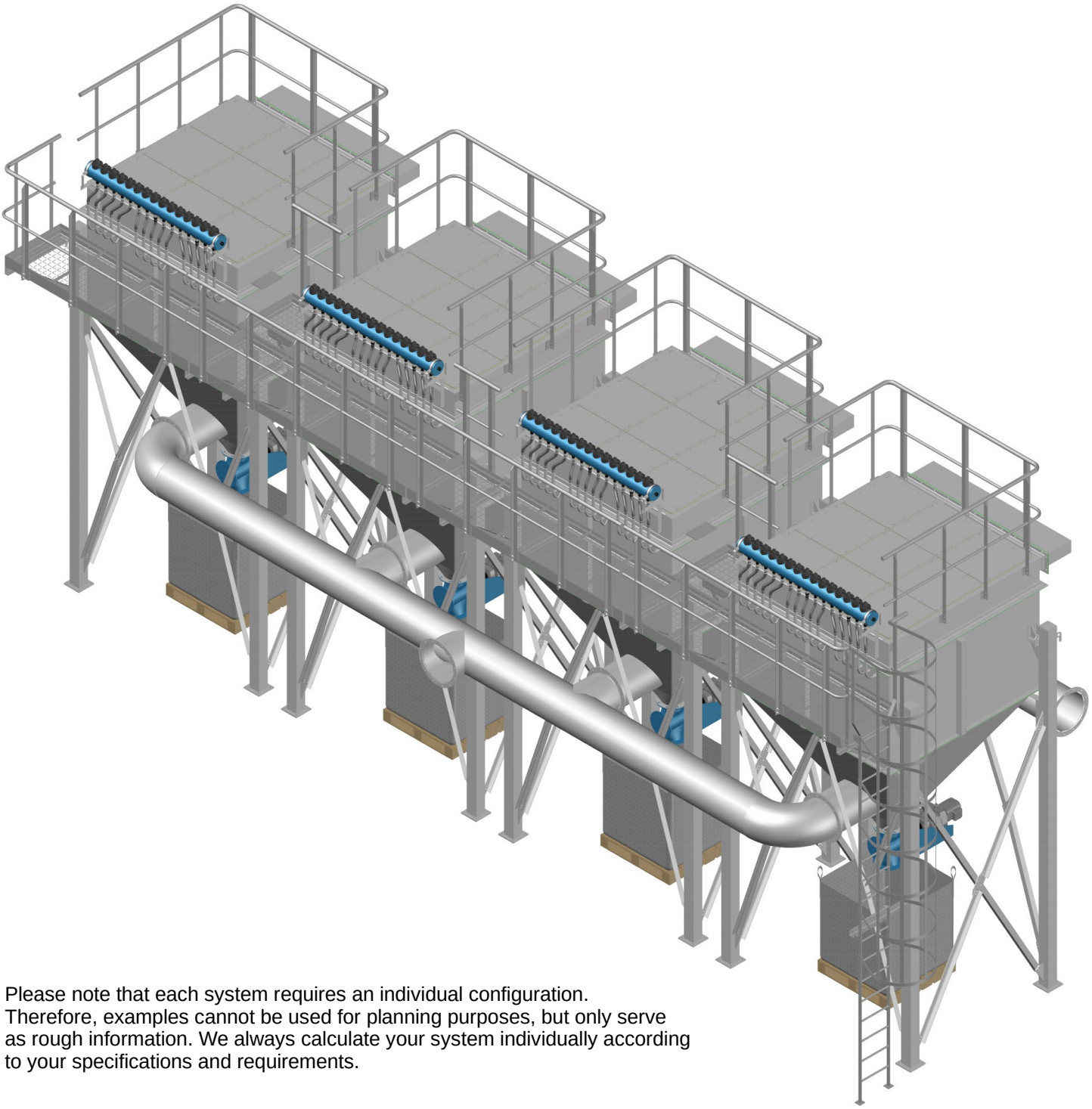
The insulation at the outside of filter body keeps it from corrosion, during shut down periods.

The dust inside is contaminated with sulpher and other components.

If the temperature falls below the dew point, corrosion could be happen.

Therfor a standstill heater is additionally recommended to protect the housing from corrosion. This heater is only an option, because if it is necessary depends allways only on local conditions.

The filter can easily removed when necessary.
It can be replaced by operation staff after training.



Please note that each system requires an individual configuration. Therefore, examples cannot be used for planning purposes, but only serve as rough information. We always calculate your system individually according to your specifications and requirements.

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